information related to the time differentials at which the vibration signal is received at each of the vibration sensors, the location of the touch can be calculated. Alternatively, a vibration emitter can be used to emit known vibrations in the touch plate that are altered under the influence of a touch event. The altered vibrations can be similarly detected by the vibration sensors to determine the touch location. Examples of vibration-sensing touch sensors are disclosed in International Publication WO 01/48684.

[0027] The types of touch sensors identified above are known in the art and will not be discussed in more detail. For simplicity, the following discussion will focus on a tactile touch-sensing system with a capacitive sensor.

[0028] Touch sensor **115** is positioned in front of display screen **110**. Preferably, touch sensor **115** covers most of or the entire display screen **110**. In some embodiments, touch sensor **115** is larger than the display, defining a border area outside of the display area. In some embodiments, it may be desirable to locate the tactile buttons and/or touch-generating pads within such a border area so as not to detract from the viewability of the display. In response to a touch, touch sensor **115** senses the touch and transmits signals related to the touch to the electronic device. The position of the touch may be computed by the control circuit of touch-sensing system **100** from those signals.

[0029] Touch-generating pads **121-126** are components of tactile touch-sensing system **100** for generating a touch on touch sensor **115**. Each of the touch-generating pads **121-126** is associated with a corresponding tactile button **131-136**. Touch generating pads **121-126** may be printed onto the surface of touch sensor **115**. Touch-generating pads **121-126** may also be separate components that can be detachably or permanently attached to touch sensor **115**. In an inactive state, touch-generating pads **121-126** can be configured to "float", meaning that they are not tied to any particular signal source, and are thus "invisible" to the sensing electronics. To be used on a system with a capacitive touch sensor, touch-generating pads **121-126** are configured to undergo an electrical change when activated, such as a change in electrical potential or a change in drive frequency, that can be detected by the touch sensor as a "touch." Touch-generating pads **121-126** can be activated in this manner when they are coupled to their corresponding tactile buttons **131-136**.

[0030] Tactile buttons **131-136** are components of tactile touch-sensing system **100** for providing tactile feedback to users. Each of the buttons **131-136** is configured such that when it is pressed by a user, the button electrically couples to its corresponding touch-generating pad **121-126**, thereby driving the touch generating pad **121-126** to some known potential or at some known frequency, thereby causing a "touch" on touch sensor **115**. Tactile feedback provided by tactile buttons **131-136** will be discussed in detail in conjunction with **FIG. 4**. Briefly stated, tactile feedback enables a user to know whether a tactile button has been properly activated.

[0031] Tactile buttons **131-136** may include many types of mechanisms, such as snap domes used in membrane switches, silicone elastomeric buttons, rocker switches, carbon buttons, or the like. Tactile buttons **131-136** may be fitted with key caps, printed or raised symbols, or the like, to enhance the functionalities of tactile buttons **131-136**. For example, the buttons may be configured with lights pipes to light the buttons for applications in a low lighting environment. In other examples, the buttons may be configured to provide various types of sensory feedback, key lights, sounds, solenoid hits, etc. Any other feature that can be suitably added to any conventional tactile switch or button can also be incorporated into the present invention.

[0032] For use with a capacitive touch sensor, each of the tactile buttons **131-136** is configured to cause a corresponding touch-generating pad to capacitively couple with touch sensor **115**. In one embodiment, tactile buttons **131-136** are electrically connected to an electrical potential that is different from the potential of their corresponding touch-generating pads **121-126** in an inactive state. For example, tactile buttons **131-136** may be electrically grounded. In another embodiment, carbon tactile buttons may be used to directly short the user's finger to touch sensor **115** and may be used without a touch-generating pad.

[0033] In operation, when one of the tactile buttons **131-136** is pressed, the tactile button and its corresponding touch-generating pad come into contact and become electrically connected. As a result, the electrical state of the touch-generating pad is changed from its inactive state to a state that can be detected by the touch sensor. For example, the electrical potential of the touch-generating pad can be change from a potential that is invisible to the touch sensor to another potential. The change in electrical potential causes a capacitive coupling between touch sensor **115** and the touch-generating pad that can be detected as a touch on touch sensor **115** similar to a human touch. The coordinates of the button are reported in the same way as a normal touch on touch sensor **115**. The coordinates may be used to represent a pressed button on the electronic device.

[0034] Touch-generating pads **121-126** and tactile buttons **131-136** may also be configured to work with other types of touch sensors in addition to capacitive touch sensors. For example, touch-generating pads **121-126** and tactile buttons **131-136** for a resistive touch sensor or a force touch sensor may include mechanisms to ensure positive, mechanical contact with the touch sensor sufficient to cause a touch. For an optical sensor, touch-generating pads **121-126** may be configured to allow sensor light beams to pass through in an inactive state and to block the light beams when activated by tactile buttons **131-136**. Similarly, touch-generating pads **121-126** for a surface acoustic wave sensor may absorb the energy of the generated acoustic waves only when activated by tactile buttons **131-136**. Touch-generating pads **121-126** for vibration sensing touch sensors may include mechanisms to ensure an impact with the touch sensor sufficient to cause vibrations in the touch sensor that can be detected as a touch. In other instances, the touch generating pads can include transducers such as piezoelectric devices configured to emit vibrations when activated.

[0035] **FIG. 3** is a frontal view of tactile touch-sensing system **100** shown in **FIG. 2**. As shown in the figure, touch-generating pads **121-126** cover a portion of touch sensor **115**. Tactile buttons **131-136** are shown to be arranged over touch-generating pads **121-126**, although any configuration can be used that allows some coupling between the buttons and the pads either directly or through one or more other elements so that activation of a button can activate an associated pad. In the embodiment shown, a